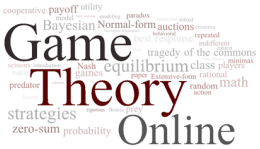


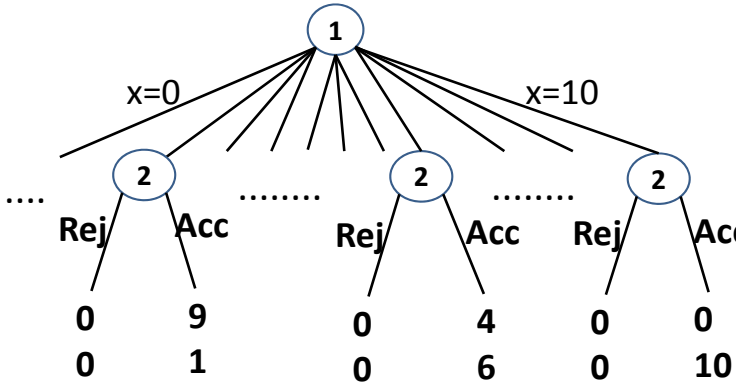
Subgame Perfect Application: Ultimatum Bargaining

Game Theory Course:
Jackson, Leyton-Brown & Shoham

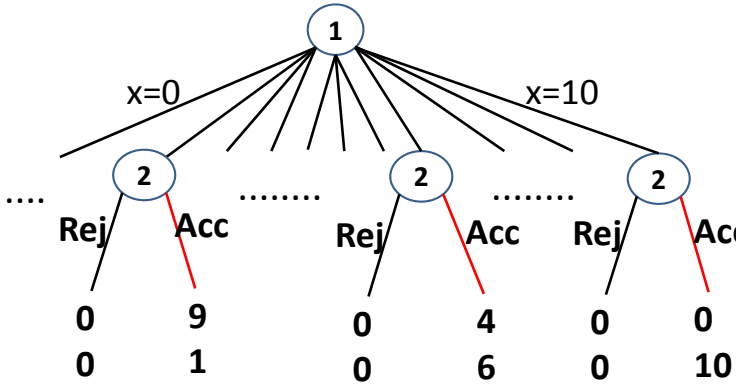
Ultimatum Bargaining

- Player 1 makes an offer $x \in \{0, 1, ...10\}$ to player 2
- Player 2 can accept or reject
- 1 gets $10 - x$ and 2 gets x if accepted
- Both get 0 if rejected

Ultimatum Bargaining

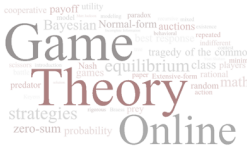


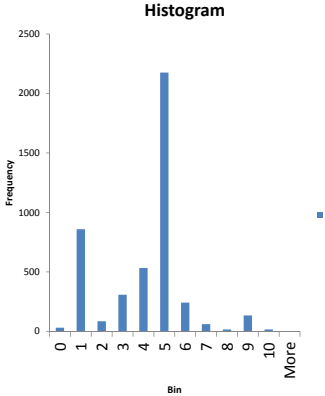
Ultimatum Bargaining

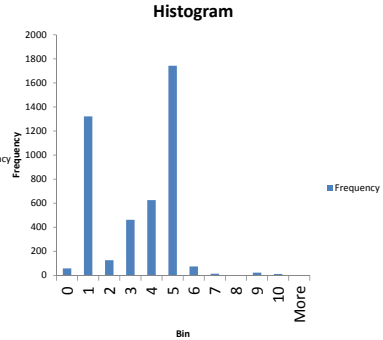


Ultimatum Bargaining: Subgame Perfect Equilibria

- Player 2 accepts every positive x
- If offered 0, Player 2 is indifferent could accept or reject (or even mix)
- Player 1 offers either 0 or 1 depending on 2's decision at 0

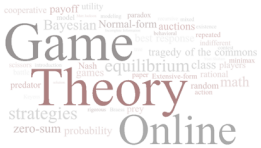


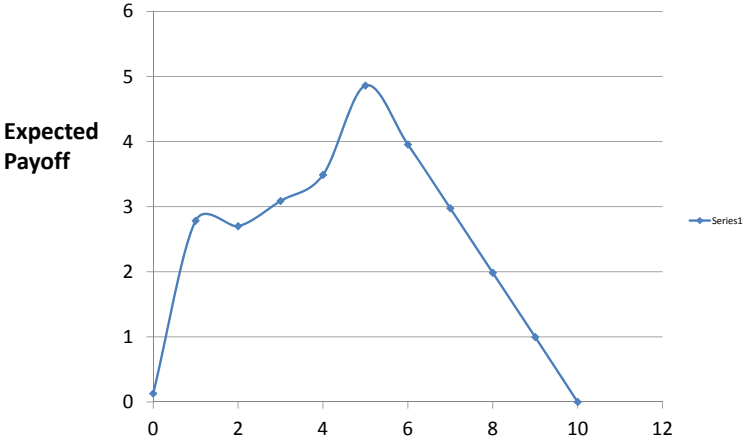




Offers **Min Accept**

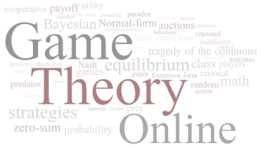
2012 Online


Game
Theory
Online
Bayesian
Normal-form
auctions
tragedy of the commons
equilibrium
Nash
math
strategies
zero-sum
probability


Expected Payoff
6
5
4
3
2
1
0
0
2
4
6
8
10
12
Series1
Offer

2012 Online

Experiments: Does Size of Pie Matter?



- Robert Slonim and Alvin Roth (1998) "Learning in High Stakes Ultimatum Games: An Experiment in the Slovak Republic," *Econometrica*, Vol 66, pp 569-596.
- Varied from 60 Slovak Crowns, to 300, to 1500
- Average monthly wage then was 5500.
- So high stakes version is a week's wage.

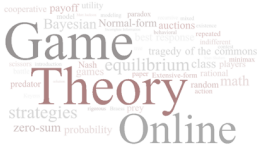
Slonim and Roth Experiments: Does Size of Pie Matter?

- No significant differences across games in Offers:
  - 1000 units = 60SC: 451 avg, 465 median
  - 1000 units = 300SC: 460 avg, 480 median
  - 1000 units = 1500SC: 423 avg, 450 median
- Significant differences across games in Rejections of Offers of less than 250 Units:
  - 60SC: 1/1 rejected
  - 300SC: 10/21 rejected
  - 1500SC: 12/32 rejected

Ultimatum Bargaining

- Subgame Perfection does not Always Match Data (Nash?)
- Rejections violate "rationality"?
- Or do we have the payoffs incorrect: people value equity, or feel emotions... Behavioral Game Theory

Summary: Subgame Perfection



- Subgame perfection and backward induction encapsulate *sequential rationality*
- Result in subset of Nash equilibria
- Impose credibility in circumstances never reached: *off-the-equilibrium-path*
- But some games are hard to solve: Chess!,
  - and not completely clear that people abide by the logic: need to believe in the rationality of others.
- Next up: incomplete information.